

WHAT IS CLAIMED IS:

1. A 3-dimensional image acquisition apparatus  
for acquiring images to be used for 3-dimensionally  
reconstructing an object by picking up the object  
5 twice or more than twice in an image acquisition set  
including picking up at least once the object carrying  
a pattern projected onto it, the apparatus comprising:  
a camera configured to pick up the object;  
a projection light source configured to project  
10 light for the purpose of projecting the pattern onto  
the object;  
a light projection information memory configured  
to store information on projection of light including  
information on the time for projecting light for the  
15 purpose of projecting the pattern in the image  
acquisition set;  
an image acquisition progress information memory  
configured to store information on the progress of  
image acquisition in the image acquisition set; and  
20 a controller configured to control the projection  
of light by the projection light source and the picking  
up by the camera on the basis of the information on  
projection of light stored in the light projection  
information memory and the information on the progress  
25 stored in the image acquisition progress information  
memory.

2. The apparatus according to claim 1, wherein

the information on projection of light includes information on the projection light source output from the projection light source.

3. The apparatus according to claim 1, wherein  
5 the information on projection of light includes information on the camera output from the camera.

4. The apparatus according to claim 1, further comprising:

a proper image acquisition judging section  
10 configured to judge the appropriateness of the image acquisition that one of that is being conducted and has been conducted on the basis of one of the information on projection of light and the information on the progress; and

15 an indicator configured to show the judgment result of the proper image acquisition judging section.

5. The apparatus according to claims 1, further comprising:

a proper image acquisition judging section  
20 configured to judge the appropriateness of the image acquisition that one of that is being conducted and has been conducted on the basis of one of the information on projection of light and the information on the progress, wherein

25 the controller is adapted to reset the image acquisition progress information memory so as to make it store the progress information necessary for a first

imaging session when the proper image acquisition judging section determines that the current image acquisition is not appropriate.

5       6. The apparatus according to claim 1, further comprising:

          a photometric section configured to acquire information on the luminance of the object, wherein  
          the information on projection of light includes information on the luminance acquired by the  
10       photometric section.

          7. The apparatus according to claim 1, wherein the camera includes one imaging optical system, and

          the apparatus further comprises a stereo-adaptor  
15       having a light path dividing optical system adapted to enable the camera to acquire a plurality of images from different angles when connected to the imaging optical system of the camera.

          8. The apparatus according to claim 1, further  
20       comprising an illumination light source configured to illuminate the object when picking up the object by the camera.

          9. The apparatus according to claim 8, wherein the information on projection of light includes  
25       information on the illumination light source output from the illumination light source.

          10. The apparatus according to claim 1, further

comprising an operation section configured to input the information on projection of light.

11. The apparatus according to claim 1, wherein the projection light source is adapted to project light at a first imaging session of the image acquisition set.

12. A light projection unit to be connected to a camera adapted to continuously picking up an object and output timing signals for one of the timing of picking up the object and the timing of projecting light for the purpose of projecting a pattern onto the object, the unit comprising:

a projection light source configured to project light for the purpose of projecting the pattern onto the object;

a light projection information memory configured to store information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the continuous picking up;

an image acquisition progress information memory configured to store information on the progress of the continuous picking up; and

a controller configured to control the projection of light by the projection light source in synchronism with the timing signal and on the basis of the information on projection of light stored in the light

projection information memory and the information on the progress stored in the image acquisition progress information memory.

13. The apparatus according to claim 12, wherein  
5 the projection light source is adapted to project light in synchronism with a first imaging session of the continuous picking up.

14. A 3-dimensional reconstruction system for  
acquiring images to be used for 3-dimensionally  
10 reconstructing an object by picking up the object twice or more than twice in an image acquisition set including picking up at least once the object carrying a pattern projected onto it, the system comprising:

a camera configured to pick up the object;  
15 a projection light source configured to project light for the purpose of projecting the pattern onto the object;

a light projection information memory configured to store information on projection of light including  
20 information on the time for projecting light for the purpose of projecting the pattern in the image acquisition set;

an image acquisition progress information memory configured to store information on the progress of  
25 image acquisition in the image acquisition set;

a controller configured to control the projection of light by the projection light source and the picking

up by the camera on the basis of the information on  
projection of light stored in the light projection  
information memory and the information on the progress  
stored in the image acquisition progress information  
5 memory; and

a computer configured to 3-dimensionally  
reconstructing the object on the basis of the images  
obtained by the camera.

15. A 3-dimensional image acquisition method  
10 for obtaining images to be used for 3-dimensionally  
reconstructing an object by picking up the object  
twice or more than twice in an image acquisition set  
including picking up at least once the object carrying  
a pattern projected onto it, the method comprising:

15 acquiring information on projection of light  
including information on the time for projecting light  
for the purpose of projecting the pattern in the image  
acquisition set;

20 storing information on the progress of image  
acquisition in the image acquisition set; and

conducting the image acquisition set on the basis  
of the information on projection of light acquired in  
the acquiring information and the information on the  
progress stored in the storing information.

25 16. A 3-dimensional image acquisition method for  
obtaining images to be used for 3-dimensionally  
reconstructing an object by picking up the object

twice or more than twice in an image acquisition set including picking up at least once the object carrying a pattern projected onto it, the method comprising:

acquiring information on projection of light  
5 including information on the time for projecting light for the purpose of projecting the pattern in the image acquisition set;

storing information on the progress of image acquisition in the image acquisition set; and

10 conducting the image acquisition, while projecting light for the purpose of projecting the pattern when the information on the progress indicates that a first imaging session is in progress.

17. The method according to claim 16, wherein  
15 an image acquisition is conducted on the basis of the information on projection of light when the information on the progress indicates that a second or a subsequent imaging session is in progress.

18. A 3-dimensional image acquisition method  
20 for obtaining images to be used for 3-dimensionally reconstructing an object by picking up the object twice or more than twice in an image acquisition set including picking up at least once the object carrying a pattern projected onto it, the method comprising:

25 acquiring information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the image

acquisition set, which time can be that of a first imaging session;

storing information on the progress of image acquisition in the image acquisition set; and

5           conducting the image acquisition, while projecting light for the purpose of projecting the pattern when the information on the progress indicates that the first imaging session is in progress.

19. The method according to claim 18, wherein  
10       an image acquisition is conducted on the basis of the information on projection of light when the information on the progress indicates that a second or a subsequent imaging session is in progress.

20. A method of projecting light from a light  
15       projection unit adapted to continuously pick up an object and project light for the purpose of projecting a pattern on the object while conducting the picking up, the method comprising:

acquiring information on projection of light  
20       including information on the time for projecting light for the purpose of projecting the pattern in the continuous picking up;

storing information on the progress of the continuous picking up; and

25       projecting light for the purpose of projecting the pattern in synchronism with the picking up and on the basis of the information acquired in the acquiring



information and the information on the progress stored in the storing information.

21. A method of projecting light from a light projection unit adapted to continuously pick up an object and project light for the purpose of projecting a pattern on the object while conducting the picking up, the method comprising:

acquiring information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the continuous picking up;

storing information on the progress of the continuous picking up; and

projecting light for the purpose of projecting the pattern in synchronism of a first session of the picking up when the information on the progress indicates that the first session is in progress.

22. The method according to claim 21, wherein a light projection for the purpose of projecting the pattern is conducted on the basis of the information on projection of light when the information on the progress indicates that a second session of the picking up is in progress.

23. A method of projecting light from a light projection unit adapted to continuously pick up an object and project light for the purpose of projecting a pattern on the object while conducting the picking

up, the method comprising:

acquiring information on projection of light  
including information on the time for projecting light  
for the purpose of projecting the pattern in the  
5 continuous picking up, which time can be that of  
a first session of the picking up;

storing information on the progress of the  
continuous picking up; and

projecting light for the purpose of projecting the  
10 pattern in synchronism of the first session when the  
information on the progress indicates that the first  
session is in progress.

24. The method according to claim 23, wherein  
a light projection for the purpose of projecting the  
15 pattern is conducted on the basis of the information  
on projection of light when the information on the  
progress indicates that a second session of the picking  
up is in progress.

25. A 3-dimensional image acquisition apparatus  
20 for acquiring images to be used for 3-dimensionally  
reconstructing an object by picking up the object  
twice or more than twice in an image acquisition set  
including picking up at least once the object carrying  
a pattern projected onto it, the apparatus comprising:

25 a camera for picking up the object;

projection light emission means for projecting  
light for the purpose of projecting the pattern onto

the object;

light projection information storing means for  
storing information on projection of light including  
information on the time for projecting light for  
5 the purpose of projecting the pattern in the image  
acquisition set;

image acquisition progress information storing  
means for storing information on the progress of image  
acquisition in the image acquisition set; and

10 control means for controlling the projection  
of light by the projection light emission means and  
the picking up by the camera on the basis of the  
information on projection of light stored in the  
light projection information storing means and the  
15 information on the progress stored in the image  
acquisition progress information storing means.

26. A light projection unit to be connected to a  
camera adapted to continuously picking up an object and  
output timing signals for one of the timing of picking  
20 up the object and the timing of projecting light for  
the purpose of projecting a pattern onto the object,  
the unit comprising:

projection light emission means for projecting  
light for the purpose of projecting the pattern onto  
25 the object;

light projection information storing means for  
storing information on projection of light including

information on the time for projecting light for the purpose of projecting the pattern in the continuous picking up;

5 image acquisition progress information storing means for storing information on the progress of the continuous picking up; and

control means for controlling the projection of light by the projection light emission means in synchronism with the timing signal and on the basis of  
10 the information on projection of light stored in the light projection information storing means and the information on the progress stored in the image acquisition progress information storing means.

27. A 3-dimensional reconstruction system for  
15 acquiring images to be used for 3-dimensionally reconstructing an object by picking up the object twice or more than twice in an image acquisition set including picking up at least once the object carrying a pattern projected onto it, the system comprising:

20 a camera for picking up the object;

projection light emission means for projecting light for the purpose of projecting the pattern onto the object;

light projection information storing means for  
25 storing information on projection of light including information on the time for projecting light for the purpose of projecting the pattern in the image

acquisition set;

image acquisition progress information storing  
means for storing information on the progress of image  
acquisition in the image acquisition set;

5 control means for controlling the projection of  
light by the projection light emission means and  
the picking up by the camera on the basis of the  
information on projection of light stored in the  
light projection information storing means and the  
10 information on the progress stored in the image  
acquisition progress information storing means; and  
computing means for 3-dimensionally reconstructing  
the object on the basis of the images obtained by the  
camera.